

LBNE LAr Parameters Spreadsheet

Version 10.6 - 11/4/2011

Changes highlighted in RED

33 kton

Input value

Calculated

Reference Design, 800'

Quality Meaning

*** Stable, well understood parameter

** Reasonably well defined parameter

* Rough estimate

Parameter	Value	Units	Qual ity	Req ID	Notes
Anode Plane Assembly (APA)					
Cathode Plane Assembly (CPA)					
Detector Module					
Cryostat module					
Electronics					
Mux level	3840		**		Ref docdb
Readout redundancy	4		**		
Front end amplifier shaping time	1.0	micro-sec	***		Choices are 0.5, 1 and 2 micro-sec
Analog front end power	10	mW/chan	**		Design goal
Digital front end power	5	mW/chan	**		includes line driver power
Power conversion efficiency	80%		**		voltage drop in cables and regulator
Electronics power dissipation	19	mW/chan			
Electronics power total	5.2	kW			
ENC @ 90K	563	electrons	***		BNL ASIC measured
ENC @ 300K	1175	electrons	***		BNL ASIC measured
dE/dx (1 MIP)	2.1	MeV/cm	***		
W ion (ionization energy)	23.6	eV	***		
Recombination factor @ 500 V/cm	70%		***		NIM A523, 3 (2004)
Ionization 1 MIP - min	28030	electrons			
Electron drift velocity	1.6	mm/msec	***		Drift velocity for 500 V/cm electric field
Electron drift time	2.31	ms			
Electron lifetime assumption	1.4	ms	NA		Set to achieve minimum S/N = 9
Equivalent O2 contamination	229	ppt			ICARUS, A. Bettini, et al., NIM A305 (1991) 177.
Signal to noise ratio - max	50				For 1 MIP
Signal to noise ratio - min	10				For 1 MIP
Diffusion coefficient - Long	5.3	cm^2/s	**		
Diffusion coefficient - Trans	12.8	cm^2/s	**		at 500 V/cm (IEE Trans. on Dielectrics 5 (1968) 450)
Long diffusion rms at max drift	1.6	mm			
Trans diffusion rms at max drift	2.4	mm			
ADC sampling rate	2	MHz	**		Same as ICARUS, MicroBooNE and ArgoNeuT
Num MIP dynamic range	15		**		15 MIP ionization is a reasonable maximum value
ADC resolution - min	10	bits	**		Minimum value required
High Voltage					
Drift field	500	V/cm	***		Same as ICARUS, MicroBooNE and ArgoNeuT
Cathode high voltage	185	kV			
Num cathode HV feedthrough	8		*		
Grid bias voltage	-480	V	***		Adjust to achieve transparency. Doc #2833
U plane bias voltage	-280	V	***		Adjust to achieve transparency. Doc #2833
V plane bias voltage	0	V	***		Adjust to achieve transparency. Doc #2833
Collection plane bias voltage	700	V	***		Adjust to collect electrons. Doc #2833
Cryogenics					
Detector Depth					
Radioactive Background					
Veto System					
Veto Configuration					
Veto Counter					
Photon Detector					
DAQ					
Cavern & Pit					